

## Application Fields

- Laboratory and training center in colleges and universities
- Production line test and quality Control
- Test and measurement in R&D department
- Maintenance and aftersales service

## Brief Introduction

■ DSO-3000A series digital storage oscilloscopes provide you with excellent performance and strong functions in a compact design. Even as a new generation of portable low-priced general product, the series still offers many measurement functions of middle or high end product and meets your measurement requirement with affordable cost.

With bandwidth 25MHz, 60MHz and 100MHz, the series offers a maximum real-time sample rate of 400Mps and equivalent sample rate of 10Gps to ensure you accurate observation of signal details.

Many standard advanced features such as multi triggering modes, cursor measurement functions, auto measurement, digital filtering, waveform storage, math function, FFT, PASS/FAIL judgement, multi communication interfaces, etc. make the measurement faster and easier

## DSO-3102A

### Features

- Signal bandwidth: 25MHz/60MHz/100MHz  
Real-time sampling rate: Max. 400Mps  
Equivalent sampling rate: Max. 10Gps
- 5.6-inch TFT LCD Color display with better clearance, multi-color schemes available
- With up to 2.4Mpts memory depth, more signal details can be seen.
- Independent vertical scale and position control knobs for each channel
- Edge, Pulse width and Video trigger mode available. Alternating triggering function is also available to stably display asynchronous signals
- Unique variable trigger sensitivity to suit special measurement requirements on different occasions
- Math functions including add, subtract, multiply and 1024-point FFT
- Up to 24 kinds of parameters automatic measurements
- Advanced cursor modes: Manual, Auto and Track
- Practical low-pass, high-pass, band-pass, band-reject digital filters with adjustable cut-off frequency
- Unique waveform recording and playback function.
- PASS / FAIL detection, optical isolated PASS/FAIL output
- Built-in 5 digital hardware frequency counter
- Auto-calibration feature
- Multiple language user interface
- Pop-up menu, the user operation more convenient and intuitive
- Embedded help information system in Chinese and English
- Up to 10 internal setup and waveform files memories, external storage of setup, track, waveform, BMP bitmap and CSV files
- USB Host Port, Support USB disk storage, and firmware upgrade can be carried out through an USB disk.
- PRINT button pressed to directly store the screen image (BMP) or the waveform data (CSV) in an USB disk
- USB device and RS232C interface for the instrument remote control

## Prominent Signal Measuring Capability

### Observation of the signal more clearly

DSO-3000A Series features a 5.6-inch 320x234 TFT LCD color display for watching signals from any viewing angle. Different from traditional oscilloscope's fixed menu display, DSO-3000A can display the waveform to full screen according to your need.

**Single MENU ON/OFF key** enables you to view more information in 25% more display area.

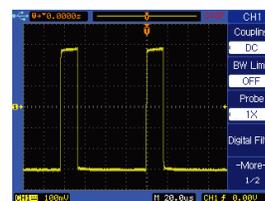


Figure 1 Normal display with menu on

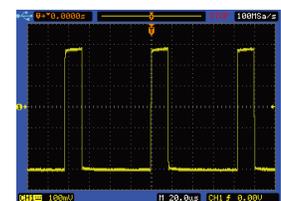


Figure 2 Full-screen display with menu off

### Deep memory depth for capturing more

Maximum 2.4Mpts memory depth for each channel on all models, DSO-3000A Series is easy to record and analyze the waveform. Even under the slow time base settings, you can maintain a high sampling rate. This allows you observe the signal in more details. In a given sampling speed, the more sampling points mean the longer the time observed.

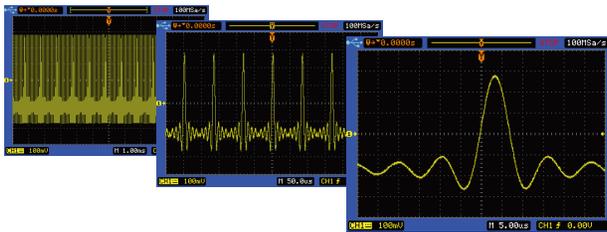


Figure 3 Deep memory depth waveform display

### Delayed sweep mode for both details and the whole waveform

In Delayed sweep mode, you can view simultaneously the details on a particular part and the whole waveform. Through split display you can zoom in on a particular area on your signal while still viewing the entire captured waveform.

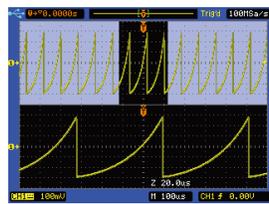


Figure 4 Delay mode to observe signal details

## Powerful Functions

DSO-3000A series oscilloscope is your indispensable assistant to get your job done easier and faster.

### Auto scale

Auto scale can evaluate all input signals and sets the correct condition to best display the signals. Single period or multi periods can be selected to display in the current display window.

### Running control

**RUN/STOP mode:** The oscilloscope starts or stops repetitive acquisition, so you can observe the waveform continuously or freeze the current waveform on the screen.

**SINGLE mode:** The oscilloscope acquires a single trigger of data when trigger condition is met. It is useful to capture single shot signals.

### Math Function and FFT

DSO-3000A series provides some important math operations, including addition, subtraction, multiplication, or 1024-point FFT (Fast Fourier Transforms). For time-domain signal analysis, you can use additions (signal superimpose), subtraction (elimination of noisy component or differential operation, etc.), multiplication (frequency mixing, etc.) processes. For frequency-domain analysis, you have FFT (Fast Fourier Transforms) with five windowing operation (Rectangular, Hanning, Hamming, Blackman, Flat-Top). And spectrum amplitudes of FFT can be displayed in linear or dBV (RMS) scale type.

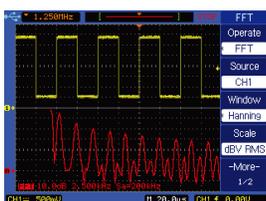


Figure 5 FFT analysis (dBV)

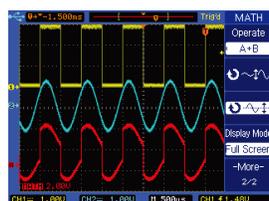


Figure 6 Addition operation

### 24 Automatic Parametric Measurements

DSO-3000A series provides up to 24 automatic parametric measurements. You can either install three commonly used screen measurements or display all the 24 measurements of the current selected source on the screen. Auto measurement can not only save your time for eye observation, but also provide you more accurate results. Without complicated operation, you can get your measurement results easily and quickly.

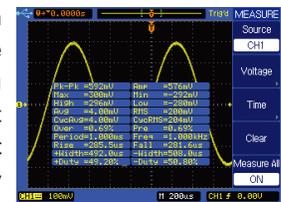


Figure 7 Auto measurement display

### Convenient observation of all signals

**Roll mode:** It is one of the useful features of DSO-3000A series to test low-speed signal accurately. Using the Roll mode, the change of ultra slow speed signal can be observed.

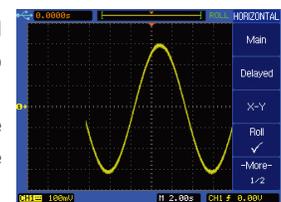


Figure 8 Slow speed signal in Roll mode

**X-Y mode:** In X-Y mode, channel 1 becomes the X input and channel 2 becomes the Y input. Lissajou's figure can be displayed to calculate phase difference of same-frequency signals.

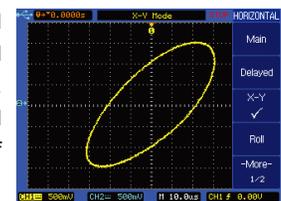


Figure 9 Lissajou's figure in X-Y mode

**Video Trigger:** DSO-3000A series can synchronously trigger on specified line or field of the standard NTSC or PAL/SECAM video signal.

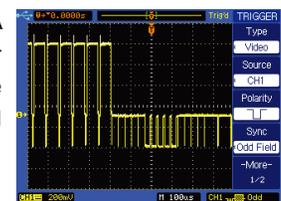


Figure 10 Video trigger mode for TV signal

## More Functions

### Digital Filter

DSO-3000A series provides several digital filters, including low pass, high pass, band pass, and band reject filters. It can be applied to displayed signals to acquire expected results, such as to simulate the effect of a hardware filter, to reject aliasing noise or error signal to clearly observe a signal of interest, etc. The high and low cut-off frequency can be set randomly.

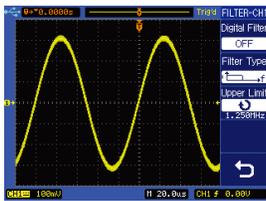


Figure 11 Signal with noises

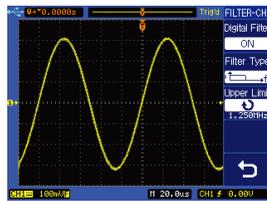


Figure 12 Signal processed with a low pass filter

### Waveform Record and Replay

DSO-3000A series can record the input signal over a period of time continuously in the internal or external memory for future analysis. Up to 1000 frames can be recorded with the variable time interval ranging from 1 ms to 1000s. The recorded frames can be played back continuously or played frame by frame, so that you can observe any frame and capture any tiny abnormality.

### PASS/FAIL Judgment

On the production line, it is valuable to judge some kind of signal and decide if it is good or not. DSO-3000A series can measure the selected input signal and compare it with the predefined PASS/FAIL regulations and then output the PASS/FAIL result. This function is quick and easy and can greatly reduce the man-made mistakes.

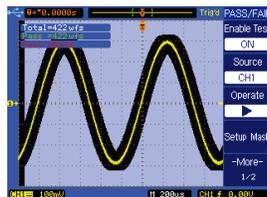


Figure 13 PASS/FAIL measurement

### Auto Calibration

DSO-3000A can automatically calibrate its vertical, horizontal and trigger system, so that it can operate with the best measurement accuracy.

### Unique Built-in Function/Arbitrary Waveform Generator Module

- The first digital oscilloscope with built-in function/ arbitrary waveform generator module in the world
- More accurate, stable and low distortion output with the help of advanced DDS technology
- 200MSa/S sampling rate, 14bits vertical A/D resolution
- 10MHz / 20MHz / 40MHz sine/ square waveform frequency output
- Maximum 10MHz impulse signal frequency output

- Up to 30 kinds of built-in waveforms with up to 1MHz output frequency, such as sine, square, triangle etc.
- Built-in multiple modulation function, including AM, FM, PWM, FSK, PSK and Bias modulation.
- 1uHz to 40MHz frequency sweep in Up, Down and Round sweep mode.
- Up to 30 kinds of commonly used waveforms burst output, including sine, square, triangle waveforms
- 8kpts arbitrary waveform memory depth

## Flexible Human-Machine Interface

### Logical and easy operation

Different function areas, including input channels, time base, trigger channel and function areas, are positioned and marked respectively, so that it is easy to access and operate. The main front-panel keys light when the corresponding functions are available or active. This human-oriented feature makes your job much easier.



Figure 14 The front panel key board

### Multi interface selections

The instrument provides multi interfaces, including USB host interface used to store waveform files (BMP, CSV file format) to an USB disk by simply pressing "PRINT" key, and USB device interface or RS232 interface used to communicate with a computer to control the instrument or to transmit the waveform data.

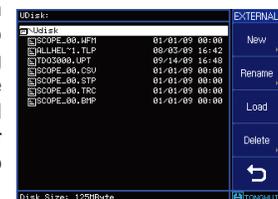


Figure 15 USB disk file system

### Software update

The latest updated software of DSO-3000A series can be downloaded free from our website ([www.leaptronix.com](http://www.leaptronix.com)), and can be loaded to the corresponding oscilloscope through the USB host interface.

## Specifications

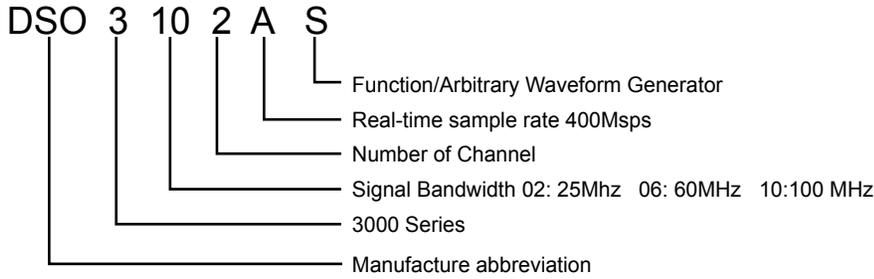
Model	DSO-3022A/DSO-3022AS		DSO-3062A/DSO-3062AS	DSO-3102A/ DSO-3102AS
<b>Sampling System</b>				
Max real time sampling rate	400Msps			
Max equivalent sampling rate	10Gsps			
Memory depth	Single channel ON:2.4Mpts Double channel ON:1.2Mpts			
Vertical A/D resolution	8 Bits			
Sampling mode	Sample, Peck detect, Averaging			
Auto scale	Automatically set vertical scale(V/div), time base(s/div), and trigger mode.			
<b>Vertical System</b>				
Channels	2 analog input channels and 1 trigger input channel			
Bandwidth	25MHz	60MHz	100MHz	
Coupling	DC, AC and GND			
Bandwidth limit (-3dB)	Not available		20MHz	
Calculated rise time	<14.0ns	<5.83ns	<3.50ns	
Vertical scale (V/div)	2mV/div to 5V/div 1-2-5 step			
Vertical gain accuracy	2mV/div, 5mV/div $\pm 4\% \times \text{reading} \pm 0.1 \text{div} \times \text{V/div} + 0.5 \text{mV}$ ; 10mV/div to 5V/div $\pm 3\% \times \text{reading} \pm 0.1 \text{div} \times \text{V/div} + 1 \text{mV}$ ;			
Vertical offset range	$\pm 8$ div away from the screen center			
Probe attenuation factor	$\times 1, \times 10, \times 100, \times 1000$			
Input impedance	1M $\Omega$   18pF			
Delay differential	$\pm 150$ ps when vertical scale and coupling settings are identical			
Max. input voltage	400V (DC+AC peak,@1M $\Omega$ )			
Probe compensation output	3Vp-p, 1kHz			
<b>Horizontal System</b>				
Time base range (1-2-5step)	10ns—50s/div	5ns—50s/div		
Horizontal mode	Main, Delayed, X-Y and Roll			
Time base accuracy	$\pm 0.01\%$			
XY mode	Input	X-axis input (horizontal): CH1 Y-axis input (vertical): CH2		
	Bandwidth	25MHz	60MHz	100MHz
	Phase error	$\pm 3^\circ$		
<b>Trigger System</b>				
Trigger source	CH1, CH2, EXT, EXT/5, LINE, Alternating			
Trigger mode	Auto, Normal, Single			
Trigger coupling	DC, AC, LF-reject, HF-reject			
Trigger type	Edge, Pulse width, Video			
Trigger level range	Internal: $\pm 8$ div from screen center; EXT: $\pm 1.6$ V; EXT/5: $\pm 8$ V			
Trigger sensitivity	0.1div to 1.0div user adjustable			
EXT input impedance	1M $\Omega$   18pF			
EXT max. Input voltage	400V (DC+AC peak,@1M $\Omega$ )			
<b>Signal Measurement</b>				
Voltage parameters	Max, Min, VPP, High, Low, Amplitude, Average, RMS, Overshoot, Preshoot, Cycle average, Cycle RMS			
Time parameters	Frequency, Period, Rise time, Fall time, +Width, -Width, +Duty, -Duty, Delay, Phase, X@MAX, X@MIN			
Math functions	CH1-CH2, CH1+CH2, CH1 $\times$ CH2, FFT(1024points)			
Cursor measurement	Manual, Auto, Track			
Hardware frequency counter	5-digit frequency counter up to full bandwidth			
<b>Storage &amp; Interface</b>				
Internal storage	10 setup files and 10 trace files			
File format	Setup, Waveform, Trace, BMP and CSV file			
Interface	USB HOST, USB DEVICE, RS232C and PASS/FAIL OUT			
<b>Display System</b>				
Display screen	TFT LCD display, 5.6-inch			
Resolution	320( horizontal ) $\times$ 234(vertical) dot matrix			
Color	24 bit true color			
Menu language	Simplified Chinese, Traditional Chinese, English etc.			
Waveform Display	Scale	Menu ON:8div(vertical) $\times$ 10div(horizontal) i.e. 200(vertical) $\times$ 250(horizontal) dot matrix Menu OFF:8div(vertical) $\times$ 12div(horizontal) i.e. 200(vertical) $\times$ 300(horizontal) dot matrix		
	Type	Dot , Vector		
	Interpolation	(Sinx)/x, Linear		
	Persistence	Off, Infinite		
	Format	YT / XT		
<b>Other Specifications</b>				
Operation ambient temperature & humidity	0°C to 40°C, $\leq 90\%$ RH			
Line voltage	99V to 242V AC,47Hz to 440Hz			
Power consumption	$\leq 50$ VA			
Instrument dimension	320mm(W) $\times$ 156.5mm(H) $\times$ 123mm(D)			
Net weight	Approx. 2.5kg			

## Function/Arbitrary Waveform Generator Specifications

Model	DSO-3022AS	DSO-3062AS	DSO-3102AS
<b>Frequency Characteristics</b>			
Max output frequency	10MHz	20MHz	40MHz
Sine, Square waveform	1μHz--10MHz	1μHz--20MHz	1μHz--40MHz
Pulse waveform	1μHz--10MHz		
Other waveforms	1mHz--1MHz		
Frequency resolution	1μHz(Sine, Square, Pulse), 1mHz(other)		
Frequency accuracy	±5×10 <sup>-4</sup>		
Frequency stability	±5×10 <sup>-5</sup>		
<b>Sine Characteristics</b>			
Harmonic Distortion	<5MHz:	-50dBc	
	≤10MHz:	-45dBc	
	>10MHz:	-40dBc	
Total harmonic distortion	20Hz--100kHz:	≤0.2%	
<b>Amplitude Characteristics</b>			
Amplitude range into 50Ω	When freq.≤20MHz, 1mVpp to 10 Vpp When freq. > 20MHz, 1mVpp to 3.16 Vpp		
Amplitude range into open circuit	When freq.≤ 20MHz, 2mVpp to 20 Vpp When freq. > 20MHz, 2mVpp to 6.32 Vpp		
Max resolution into 50Ω	1μVp-p		
Max resolution into open circuit	2μVp-p		
Amplitude accuracy	±2%+1mV (1kHz sine waveform)		
Amplitude stability	±1 % in 4 hours		
Amplitude flatness (Sine, Square, Pulse)	When freq. ≤ 5 MHz:	±5%	
	When freq. > 5MHz:	±10%	
Amplitude flatness (other waveforms)	When freq. ≤ 50 kHz:	±5%	
	When freq. > 50kHz:	±20%	
Output impedance	50Ω		
<b>AM Modulation Characteristics</b>			
Carrier waveforms	Sine, Square		
Source waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.		
Source frequency	1mHz to 1MHz		
Source depth	1% to 120%		
<b>FM Modulation Characteristics</b>			
Carrier waveforms	Sine, Square		
Source waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.		
Source frequency	1mHz to 1MHz		
Frequency deviation	0.1% to 99.9%		
<b>PWM Modulation Characteristics</b>			
Carrier waveform	Pulse		
Source waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.		
Source frequency	1mHz to 1MHz		
Width deviation	1% ~ 99%		
<b>FSK Modulation Characteristics</b>			
Carrier waveform	Sine		
Hop frequency	1μHz to 10MHz		
Interval time	1ms to 40s		
<b>PSK Modulation Characteristics</b>			
Carrier waveform	Sine		
Hop phase	1° to 360°		
Interval time	1ms to 40s		
<b>DCOM Modulation Characteristics</b>			
Carrier waveforms	Sine, Square		
Source waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.		
Source frequency	1mHz to 1MHz		
Function description	Realize addition of carrier waveform and modulated waveform		
<b>Frequency Sweep Characteristics</b>			
Waveforms	Sine, Square		
Frequency range	1μHz to 10MHz	1μHz to 20MHz	1μHz to 40MHz
Sweep mode	Up, Down, Round		
Sweep time	1ms to 500s		
<b>Burst Characteristics</b>			
Waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.		
Counts	1 to 60000 cycles		
Burst frequency	1mHz to 1MHz		

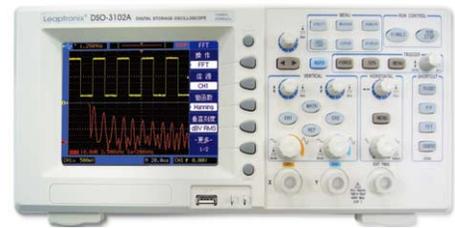
## Ordering Information

Naming principle:



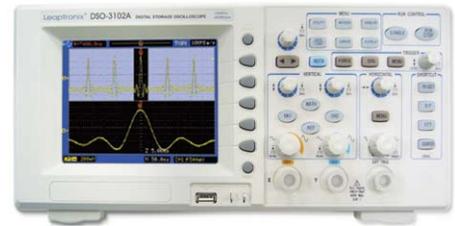
### DSO-3000A Series

Model	Real-time sample rate	Equivalent sample rate	Memory depth	Bandwidth
DSO-3022A	400Mps	10Gps	2.4Mpts	25MHz
DSO-3062A	400Mps	10Gps	2.4Mpts	60MHz
DSO-3102A	400Mps	10Gps	2.4Mpts	100MHz



### DSO-3000AS Series

Model	Real-time sample rate	Equivalent sample rate	Memory depth	Function/Arbitrary Waveform Generator
DSO-3022AS	10Gps	10Gps	2.4Mpts	10MHz
DSO-3062AS	10Gps	10Gps	2.4Mpts	20MHz
DSO-3102AS	10Gps	10Gps	2.4Mpts	40MHz



### Instrument Accessories

DSO-XXX	oscilloscope probe (XXX indicating bandwidth)	2
	3-wire power cord	1
	CD, included PC software and user's manual	1

### Options

BNC cable

